Complications of Transverse Distal Penile Island Flap
Urethroplasty of Complex Anterior Urethral Stricture

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Purpose: To report the complications of transverse distal penile island flap urethroplasty for urethral reconstruction in adult patients with long/multiple segments anterior urethral stricture.

Materials and Methods: This prospective study was carried out on 55 patients with complex anterior urethral stricture to study complications of transverse distal penile island flap urethroplasty in two teaching hospitals between June 2002 and December 2008. Pre-, intra- and postoperative information were collected on a pro forma to generate data, which was analyzed.

Results: The patients' mean age was 43.83 years (range, 19 to 73 years). The leading etiology of the stricture was urethral inflammation (76.4%) with the commonest complication being infection: wound infection in 9.1%, urosepsis in 3.6%, and epididymo-orchitis in 1.8% of the subjects.

Conclusion: Transverse distal penile island flap urethroplasty has a remarkable outcome in treatment of a long/multiple segment urethral stricture with few manageable complications.

Keywords: urethral stricture, Island flap, reconstructive surgical procedures

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INTRODUCTION

Reconstruction of the urethral stricture is one of the oldest problems in reconstructive surgery, which can pose a great challenge to a surgeon.[1] It represents a significant part of the workload of the urologists. There are two main approaches to open surgical reconstruction of the urethra in patients with urethral stricture: resection of the stricture with end-to-end anastomosis and substitution techniques by grafts or flaps. The latter technique is often used for complex strictures in which resection and anastomosis are not possible.[2]

A urethral stricture is considered complex when it has focally dense segment(s), a long length, or multiplicity with or without associated deficiency of the penile skin. Complex strictures pose problems to the management, due to their length and associated spongiofibrosis.[3] A variety of donor tissues have been used both experimentally and clinically for repair of complex urethral strictures, including the penile or preputial skin,[4] the bladder mucosa,[5] the buccal mucosa,[6] the tunica vaginalis,[7] the peritoneum,[8] and the intestinal submucosa.[9]

Transverse distal penile island flap, as described by Quartey in 1983,[2] has been used for one-stage urethral reconstruction and has led to good functional and cosmetic results

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in the past three decades.[10,11] The penile skin is supplied axially by superficial external pudendal vessels and is well-vascularized; it is hairless and the pedicle can be constructed; hence, the skin can reach anywhere from the external meatus to the prostatic urethra for reconstruction as a patch or tube.[2]

The total impact of transverse distal penile island flap on the patient is still unknown; hence, further studies of postoperative complications are still necessary.[12] We report the complications of transverse distal penile island flap urethroplasty for urethral reconstruction in adult patients with long/multiple segments anterior urethral stricture.

MATERIALS AND METHODS

This prospective study was carried out between June 2002 and December 2008 on 55 patients with complex anterior urethral stricture treated by transverse distal penile island flap urethroplasty by the same team of surgeons in two referral centers. Thereafter, patients were followed up for a period of 1 to 5 years, and those who left the follow-up in less than 1 year were excluded from the study. Pre-operative history, investigations, intra-operative stricture length, and postoperative complications were all recorded according to a pre-determined pro forma.

Retrograde urethrography (pericatheter) was performed at 3 weeks postoperatively. Urethral catheter was removed thereafter and the patient was discharged and referred to the follow-up clinic. The outcome of the reconstruction was assessed by patient's subjective evaluation of his pre-operative symptoms, direct observation of the urine stream during micturition, and postoperative retrograde urethrography at 3 to 6 weeks. The outcome was considered satisfactory when there was resolution of the pre-operative symptoms, patent lumen with smooth outline on retrograde urethrogram, a good stream of urine on direct observation, flow rate $>$ 15mL/sec, or ultrasonography observation of post-void residual urine $<$ 100mL. The complications noted were grouped into early (within 21 days postoperation) and late (after 21 days postoperation). The data were analyzed using SPSS software (Statistical Package for the Social Science, version 14.0, SPSS Inc, Chicago, Illinois, USA). *P* values less than .05 were considered statistically significant.

RESULTS

The patients' mean age was 43.83 years (range, 19 to 73 years). Thirty-nine patients (71%) had urethral dilatation in peripheral hospitals and 47 patients (85.5%) had urinary diversion with suprapubic cystostomy before presentation to our clinics. The etiologies of the stricture are shown in Table 1, with inflammation as the leading cause (76.4%). Forty-four patients (80.0%) had significant growth of bacteria on urine culture, while 8 (14.5%) had no significant bacterial growth, and the remaining 3 (5.5%) had mixed growth of organism (probably contaminants).

The mean stricture length was 4.9 cm (range, 2.5 to 14 cm). There were multiple stenotic segments in 42 patients (76.4%). Postoperative complications were seen in 13 patients, with a complication rate of 23.6% (Tables 2 and 3). Among the 5 patients with perineal wound infection (Figure 1), 2 had systemic manifestations of urosepsis with fever, chills, and rigor. Three patients developed temporary urethrocutaneous

Table 1. Etiology of the stricture

Etiology	Frequency	Percentage (%)
Inflammation	42	76.4
Trauma	9	16.4
Instrumentation	1	1.8
Unknown	3	5.5

Table 2. Early postoperative complications

Complications	Frequency	Percentage (%)
Perineal Wound Infection	5	9.1
Urosepsis	2	3.6
Urethrocutaneous Fistula	3	5.5
Penile Skin Necrosis	2	3.6
Epididymo-orchitis	1	1.8
Scrotal Hematoma	2	3.6
Total no of patients	9	16.4

Table 3. Late postoperative complications

Complications	Frequency	Percentage (%)
Recurrence	1	1.8
Urethral Diverticulum	3	5.5
Total no of patients	4	7.3

Figure 1. Severe perineal wound infection.

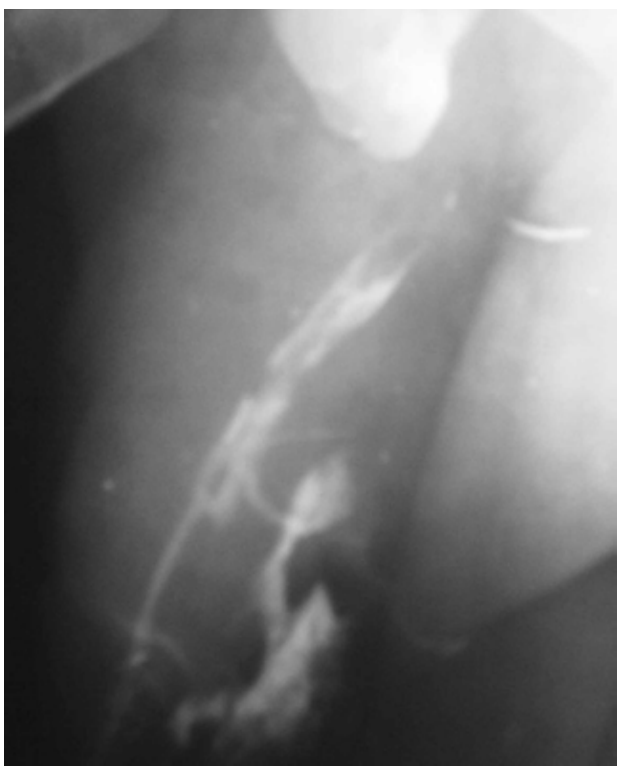

Figure 2. Postoperative pericatheter urethrogram showing a urethrocutaneous fistula which closed spontaneously.

Figure 3. Penile skin (donor site) ulcer.

Figure 4. Retrograde urethrogram showing urethral diverticulum at the site where the flap was sutured to the urethra as an onlay repair.

fistula, which closed spontaneously before 6 weeks postoperation (Figure 2) and 1 had partial necrosis of the ventral penile skin in addition, which was treated with serial wound debridement and culture sensitive antibiotics (Figure 3). Three patients had asymptomatic urethral diverticulum seen on their postoperative retrograde urethrography (Figure 4).

The hospitalization stay ranged between 18 and 32 days with the mean of 21.42 days. One patient presented 2 years after treatment with recurrence of the stricture, which had to be treated by two-staged substitution urethroplasty. Overall success rate of the procedure was 98.2%.

DISCUSSION

Single stage repair of a long segment urethral stricture using a well-vascularized flap is superior to the multiple stage procedure. Since single stage repair is more cost-effective and also reduces the risks of multiple anesthesia and surgeries; hence, it is more acceptable and satisfying to the patient.[13] However, one of the factors determining the success rate is the availability of an appropriate vascularized skin flap. When a vascularized skin flap is not available, attendant complications like recurrence and urethrocutaneous fistula may make a single stage substitution urethroplasty a sub-optimal alternative.[12] The transverse distal penile island flap raised from the distal penile skin can be used as a tube or a patch for the repair of urethral stricture.[13-16]

In 55 patients that were treated by transverse distal penile island flap in this study, infective complications were the commonest complication (14.6%). This can presumptively be explained by the high rate of pre-operative urinary tract infection with positive culture in 80% of the patients. In addition, a larger percentage of these patients have had one or more attempts at treatment before presentation (urethral dilatation (71%) and/or suprapubic cystostomy (85.5%)), which are likely to increase the infective complications.

Although urinary tract infection is often present because of associated stasis of urine, early presentation by patients or early referral to urologists by general practitioners in peripheral hospitals can reduce pre-operative instrumentation and subsequently infective complications. One of the advantages of the vascularized flap over graft is its ability to survive when there is infection or severe peri-urethral fibrosis, since the vascularized flap does not depend on the blood supply of the native tissue.[17,18] Of 150 patients treated by Quartey in 1993, there was no flap necrosis, even in the presence of pre-existing fistula or peri-urethral abscesses.[19] McAninch also reported success in 66 patients treated by distal penile flap.[20]

Recurrence is usually due to incomplete opening of the urethral lumen and the surrounding fibrotic tissue when urethrotomy is done during the operation. Hence, it is recommended to extend the incision made on the urethra during surgical repair into the adjacent normal urethral mucosa distal and proximal to the stricture site.[12]

In this study, of a total of 55 patients, only one recurrent stricture was reported (recurrence rate of 1.8%). There was no permanent urethrocutaneous fistula; the 3 reported fistulas closed spontaneously on conservative therapy within 3 weeks of follow-up. We observed that if there is no residual stricture distal to the fistula, the fistula is likely to close spontaneously. Other authors have reported similarly low incidence of urethrocutaneous fistula following the use of distal penile flap for the repair of urethral stricture, which explains the recommendation of a single stage procedure with a vascularized flap for complex anterior urethral stricture.[14-16] Distal penile flap has, thus, emerged as the most versatile tissue transferred for a long segment urethral stricture.[21]

An asymptomatic urethral diverticulum was demonstrated on the postoperative urethrogram in 3 patients. A huge urethral diverticulum can be troublesome with terminal dribbling or recurrent urinary tract infection. This can be prevented if the urethrotomy incision is made on the dorsal surface of the urethra such that the flap is applied to close the defect on the dorsal surface of the urethra.[22,23] Rao and associates used the dorsal urethrotomy incision with dorsal onlay flap with no recurrence of stricture and no

diverticulum. They concluded that dorsally placed flap is anatomically and functionally more logical compared to the traditional ventrally placed flap.[24] Occurrence of diverticulum could have been prevented in our patients if urethrotomy incision was made on the dorsal surface of the urethra.

CONCLUSION

In complex anterior urethral stricture, where the stricture length precludes excision and anastomosis, with extensive spongiofibrosis and risk of infection threatening the use of graft, a single stage repair is still possible with a distal penile island skin flap. Transverse distal penile island flap has a good outcome with few complications that are treatable.

CONFLICT OF INTEREST

None declared.

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